IODINE

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Three producers of crude iodine supplied about 28% of domestic demand in 2004 based on reported figures (table 1). Domestic and imported iodine was consumed in intermediate products prior to being sold to consumers (table 2). Iodine and its derivatives were used principally in animal feed, catalysts, colorants, inks, pharmaceutical and medical applications, photographic equipment, sanitation or disinfectants, and rosin stabilizers, in decreasing order. Published prices for crude iodine in 2004 are found in table 3. Imports of crude iodine decreased by 1%, and imports of potassium iodide increased by 3% (table 4). Exports of crude iodine decreased by 20%, and exports of potassium iodide increased by 98% during 2004 (table 5). Because some exports and imports are in product categories rather than listed as elemental iodine, net imports are not clearly distinguished. The United States is the world's third ranked iodine producer following Chile and Japan (table 6).

Commercial crude iodine normally has a minimum purity of 99.5% to 99.8%, depending on the supplier. Impurities, in order of quantity, are chiefly insoluble materials, iron, sulfuric acid, and water. The U.S. Pharmacopeia specifies an iodine content of not less than 99.8%. The Committee on Analytical Reagents of the American Chemical Society allows a maximum of 0.005% total bromine and chlorine and 0.010% nonvolatile matter.

Legislation and Government Programs

The revised fiscal year 2004 Annual Materials Plan authorized the disposal of 453,593 kilograms (kg) (1 million pounds) of crude iodine from the National Defense Stockpile (NDS) classified as excess to goal (U.S. Department of Defense, 2004§[1]). Stocks of iodine classified as excess to goal at the end of fiscal year 2004 (September 30, 2004) under the authority of the Ronald W. Reagan National Defense Authorization Act for fiscal year 2005 (Public Law 108-375 enacted October 28, 2004) were all subject to disposal limits. On March 24, 2004, the Defense National Stockpile Center (DNSC) announced the award of approximately 121,000 kg (267,000 pounds) of crude iodine for an approximate value of $1.54 million ($12.72 per kilogram or $5.77 per pound) (Defense National Stockpile Center, 2004a). On October 7, 2004, the DNSC announced the DNS-issued solicitation for iodine (DLA-Iodine-005) offering 113,000 kg (250,000 pounds) of crude iodine for sale each quarter in fiscal year 2005 under the basic ordering agreement format (Defense National Stockpile Center, 2004c). The first potential sale posting date was Monday, November 8, 2004 (Defense National Stockpile Center, 2004b).

Iodide is an essential component of thyroid hormones. Perchlorate interferes with iodide uptake into the thyroid gland; perchlorate ingestion disrupts normal thyroid functions. In January 2005, the National Research Council of the National Academies published its technical review of the "Health Implication of Perchlorate Ingestion" report. From this review, the U.S. Environmental Protection Agency (EPA) established an official reference dose of 0.0007 milligram per kilogram per day of perchlorate (U.S. Environmental Protection Agency, 2005§).

A relatively minor application, the use of silver iodide in cloud seeding has been in use since 1946. The Wyoming Water Development Commission supported an $8.8 million project to test whether cloud seeding can increase snow packs in the Medicine Bow, Sierra Madre, and Wind River ranges. The 6-year study would test the release of silver iodide into the atmosphere to seed clouds that could produce more snow. Silver iodide would be released by ground-based propane burners in areas where wind could carry it quickly up into the mountains. In the test, tracer chemicals would be combined with the silver iodide so researchers could measure the effects of the seeding in snow samples on the ground (Barron, 2005§). Ski areas in Colorado use cloud seeding to increase snow fall by an estimated 10%.

Production

The U.S. Geological Survey derived domestic production data for iodine from a voluntary canvass of U.S. operations. The three companies to which a survey request was sent responded, representing 100% of the total production (tables 1, 6).

In 1987, IOCHEM Corp. (owned by the Kita family and Tomen Corp.) began producing iodine at a plant 1.2 kilometers east of Vici, Dewey County, OK. This was the leading U.S. iodine plant. The majority of production was shipped to Schering AG of Germany under a long-term contract. IOCHEM reported having nine production wells and four injection wells with a total production capacity of 1,400 metric tons per year (t/yr) at Vici.

North American Brine Resources began operating a miniplant located at Dover, Kingfisher County, OK, in 1983. In 2004, the miniplant continued operating at an oilfield-injection-disposal site near Dover.

Woodward Iodine Corp., Woodward County, OK, was wholly owned by Ise Chemical Corporation of Japan and began production in 1977. It produced iodine from 22 brine wells and injected waste through 10 injection wells. MIC Specialty Chemicals, Inc. (a subsidiary of Mitsubishi International Corp.) was the exclusive distributor for iodine produced by Woodward.

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[1]References that include a section mark (§) are found in the Internet References Cited section.

Consumption

Establishing an accurate end-use pattern for iodine is difficult because iodine-containing intermediates are marketed before reaching their ultimate end uses.

Biocides and Disinfectants.—Iodine is an effective germicide for a wide range of microorganisms. Iodine was used with iodophors in disinfectants for use in dairies, food processing plants, hospitals, and laboratories. Polyvinyl pyrrolidinone-iodine (PVP) complexes were used because of bactericidal, fungicidal, germicidal, and general disinfecting properties. Globaline tablets were used by the U.S. military to disinfect water supplies without boiling.

Catalyst.—Iodine is used in the production of acetic acid using the Monsanto process. The process involves methanol carbonylation with an iodide-promoted rhodium complex as the catalyst. Iodide catalysts, such as titanium tetraiodide and aluminum iodide, are used in the production of butane and butene to butadiene and in the preparation of stereoregular polymers.

Chemicals.—Iodine is used as a stabilizer in the manufacture of nylon for tire cord and carpets and for converting rosins, tall oil, and other wood products to a more stable form.

Nutrition.—Iodine is a necessary mineral in mammals for a healthy thyroid. The use of iodized salt has significantly reduced the incidence of goiter in mammals. Iodine deficiency disorder can be prevented by consuming about 150 milligrams of iodine per day for a human adult.

Pharmaceuticals.—Radiopaque agents are drugs used to help diagnose certain medical problems and may contain iodine, which absorbs x rays. Radiopaque-diagnosed medical problems include brain disorders, cardiac disease, central nervous system disorders, cerebrospinal fluid, disk disease, gastrointestinal (gall bladder) disorders, peritoneal disorders, splenic and portal vein disorders, urinary track disorders, and vascular disease. Potassium iodide was used as an expectorant in cough medicines. Hydriodic acid and potassium iodide are used in the synthesis of amphetamine, ethylamphetamine, and methamphetamine, stimulants controlled under 21 CFR §1308.11.

Other.—Uses included batteries, brachytherapy [a minimally invasive procedure that implants small radioactive iodine pellets (called seeds) about the size of a grain of rice into the prostate where they irradiate the cancer from inside the gland] high-purity metals, inks and colorants, laboratory reagents, lubricants, motor fuels, and photographic chemicals.

Prices

Actual prices for iodine are negotiated on long- and short-term contracts between buyers and sellers. The average declared cost, insurance, and freight (c.i.f.) value for imported crude iodine was $13.38 per kilogram. The average declared c.i.f. value for iodine imported from Chile was $13.36 per kilogram. The average declared c.i.f. value for imported crude iodine from Japan was $13.35 per kilogram. The average sale price of iodine sold by the DNSC was $12.72 per kilogram ($5.57 per pound). Published yearend U.S. prices for iodine and its primary compounds are listed in table 3 (figure 1).

Solicitations for NDS iodine sales are made on a quarterly basis. Since 1998, only five companies—Champa Purie-Chem Industries (India), Dewey Chemicals Inc., West Agro Chemical Inc., H&S Chemical Co. Inc., and SQM North America—have purchased stockpile iodine. During the past few years, the iodine market was oversupplied, and prices dropped. However, increased global demand for iodine in 2004 resulted in price increases.

Foreign Trade

The U.S. Government adopted the harmonized commodity description and coding system as the basis for its export and import tariff and statistical classification systems. The system is intended for multinational use as a basis for classifying commodities in international trade for tariff, statistical, and transportation purposes. It includes unification of resublimed and crude iodine under the same code and free duty rate. Values that differ significantly could be a result of items being placed in the wrong category as a result of mistakes in reporting or to protect military items (tables 4-5). The International Trade Administration of the U.S. Department of Commerce provides monthly and annual import and export data by Harmonized Tariff Schedule of the United States classification.

World Review

Worldwide production of iodine in 2004 was estimated to be 24,700 metric tons (t), of which 15,600 t (63%) was produced in Chile, and 6,500 t (26%) was produced in Japan. Industrial uses of iodine are still increasing, and areas of applications are expanding beyond the established markets, which are as follows: catalysts, germicides and disinfectants, pharmaceuticals, various additives, x-ray contrast media, and other.

Chile.—Atacama Minerals Corp. reported that the purchase and sale agreement with ACF Minera S.A. to acquire ACF's 50% interest of the Aguas Blancas industrial mineral project located in the Atacama Desert of northern Chile was completed. ACF was paid $11.2 million upon conclusion of the agreement and was to receive a further payment of $4.5 million within 12 months after closing. In addition, Atacama repaid $4.3 that was owed to ACF (Lundin and Posey, 2005). Aguas Blancas has produced about 720 t/yr of high-grade iodine since 2001.

Sociedad Química y Minera de Chile S.A. (SQM) was the world's leading producer of iodine. All production was from caliche ore. The geologic origin of the caliche ore is not clear, but it is thought to be of sedimentary origin. At the Pampa Blanca Mine, located in the Sierra Gorda area, the ore is leached in piles to obtain solutions of iodine, which are transported to solar evaporation ponds.

SQM produced intermediate iodine at its five processing facilities, Mapocho, Maria Elena, Nueva Victoria, Pampa Blanca, and Pedro de Valdivia. The company planned to increase iodine production in the Nueva Victoria facility (Sociedad Química y Minera de Chile S.A., 2004). Potash Corp. of Saskatchewan (PCS) agreed to buy Israel Chemicals' stake in SQM for $100.4 million. PCS owned about 20% of SQM (Chemical & Engineering News, 2004).

Japan.—Japan was the world's second ranked producer of iodine. Iodine was manufactured in Chiba, Miyazaki, and Niigata Prefectures; Chiba Prefecture accounted for about 90% of all production in Japan. The following 8 companies operated 11 plants in Japan: Godo Shigen Sangyo Co., Ltd., Chiba Prefecture, 200 metric tons per month (t/mo); Ise Chemical Co, Ltd., two plants in Chiba Prefecture and one in Miyazaki Prefecture 300 t/mo; Japan Energy Development Co., Ltd., Niigata Prefecture, 30 t/mo; Kanto Natural Gas Development Co., Ltd., Chiba Prefecture, 100 t/mo; Nihon Tennen Gas Co., Ltd., two plants in Chiba Prefecture, 100 t/mo; Nippoh Chemicals Co., Ltd., Chiba Prefecture, 60 t/mo; Teikoku Oil Co. Ltd., Chiba Prefecture, 50 t/mo; and Toho Earthtech, Inc., Niigata Prefecture, 60 t/mo.

Current Research and Technology

Basic research on modifying hurricanes continued, funded by a $500,000 National Aeronautics and Space Administration grant. Past research concentrated on using silver iodide in clouds surrounding a hurricane's eye wall. While wind speeds decreased by 10% to 30% in four hurricanes, whether the change was owing to nature or to the seeding could not be determined. Though applications may be decades away, research suggests microwaves beamed from space could weaken or move storms (Associated Press, 2004§).

Researchers created clusters of 13 aluminum atoms that can behave like halogens and can combine with them to form halogen compounds. A 14-atom aluminum cluster could combine with iodine to yield iodide salts. When the 14-atom aluminum cluster combined with three iodine atoms, it created an ion with overall negative charge that is extremely stable. The work on clusters containing iodine could have important medical applications given iodine's key role in a number of biochemical pathways (Hunter, 2005§).

Researchers at the Missile Defense Agency's Airborne Laser (ABL) Program were attempting to build an airborne chemical oxygen-iodine laser (COIL) so powerful that it would be able to autonomously target, heat up, and destroy theater ballistic missiles (TBM) in their boost phase. In mid-November, there was a successful "first-light" test of COIL. The high-energy COIL is driven by a reaction of hydrogen peroxide and potassium hydroxide combined with chlorine gas and water that produces excited oxygen that in turn excites iodine (Schulz, 2004). A crew of four, including pilot and copilot, would operate the airborne laser during the test (Federation of American Scientists, 2005§). Boost phase intercept is a concept in which a hostile TBM is intercepted during its boost phase of flight. A TBM is a relatively large and vulnerable target—it does not maneuver, and its exhaust plume presents a very high infrared signature. The objective of the program was to develop a cost-effective, flexible airborne high-energy laser system to provide a credible deterrent and lethal defensive capabilities against boosting TBM's (Federation of American Scientists, 2005§).

New generations of nuclear energy systems are in various stages of planning and development. In 2004, about 97% of hydrogen was produced from fossil fuels by steam reformation of methane. Thermochemical hydrogen production can be achieved at temperatures of less than 900° C using the sulfur-iodine cycle compared with 2,500º C for the direct thermal decomposition of water. When sulfur dioxide and iodine are added to water, the resulting exothermic reactions produce sulfuric acid and hydrogen iodide (HI). At 450º C, the HI decomposes to iodine, which is recycled, and hydrogen. Sulfuric acid decomposes at 850° C forming sulfur dioxide, which is recycled, and water and oxygen. Nuclear power was particularly suited to hydrogen production by the sulfur-iodine cycle. The only feeds to the process are water and high-temperature heat, typically 900º C, and the only products are hydrogen, oxygen, and low-grade heat. Nuclear power is particularly well suited to hydrogen production by such a process because of its near-zero emissions (Freemantle, 2004).

A low-cost gamma radiation detector using a cesium iodide scintillator to provide faster than a half-second response to radiological threats for law enforcement personnel was introduced. Designed as a frontline security device, the product provides life critical, real-time detection of hidden radiation sources, such as weapons, nuclear power materials, or medical waste (Durstenfeld, 2005).

Outlook

During the past decade, iodine production capacity in Chile and the United States has doubled, thus ensuring an adequate world supply. Most of the iodine producers were operating close to full capacity, and there may be some tightness of supply in the short term. Domestic demand was expected to remain at current levels because production of derivatives to supply the external market was expected to move overseas.

Biocides and Disinfectants.—Demand for biocides and disinfecting chemicals remained high. Growth in the water treatment market moved from South America to India and Pakistan and then into China. Expanding treatment of water supplies for municipalities will probably increase the demand for these chemicals in the future.

Catalyst.—Iodine is used as a catalyst in the making of various chemicals, including acetic acid. With the increase in feedstock costs for natural gas and resulting increases in prices of chemicals, demand for iodine is likely to decrease.

Nutrition.—Iodine is a necessary part of animal feed to prevent goiter and regulate metabolism. People commonly receive iodine from potassium iodide (KI) added to salt. Demand for potassium iodide as a preventative of cancer of the thyroid in the event of a nuclear accident increased sales of pills to government and private individuals. More countries are providing these pills to individuals, and the demand for this compound is increasing.

Other.—Recent developments in digital imaging can produce electronic prints and overhead transparencies without the need for wet processing film. This would appear to cause a decrease in iodine usage in color film and film developing; however, 75% to 85% of all televised programs seen during prime time are recorded on 35-millimeter motion picture film and then transferred to videotape or laser disc for display, and furthermore, the majority of feature films for movie theater presentations are shot and printed on film because film provides higher image resolution. In the next decade, future uses of iodine in films and processing may be limited to specialty film imaging as digital imagery technology for motion picture improves and digital equipment and printers become more affordable.

Use of x-ray contrast media, which contain as much as 60% iodine, is expected to continue to grow between 4% and 5% per year. More medical tests on an aging population will result in increased demand for iodine-containing x-ray contrast media.

New uses of fluoroiodocarbon as halogen replacements may increase demand for iodine in fire suppression chemicals. More tests need to be completed on the iodated fluorocarbons before they are acceptable, but preliminary tests were promising. Supplementation programs designed to alleviate iodine deficiency disease (IDD) in China and India were consuming large amounts of iodine to prevent IDD. In Chile and Mexico, individual water purification units that use iodine are a new application of an existing purification process using iodine in the camping, hiking, and military water supplies. Purification applications could become significant consumers of iodine. The use of iodine to treat wood for prevention of damage by insects was approved by the EPA to replace the use of chrome-copper-arsenates (CCAs). The potential for demand in this use is high because the PVP treatment is not water soluble like other replacement material for CCA treatments.

References Cited

Chemical & Engineering News, 2004, Business roundup: Chemical & Engineering News, v. 82, no. 51, December 20, p. 17.

Defense National Stockpile Center, 2004a, Annual materials plan for FY 2004: Fort Belvoir, VA, Defense National Stockpile Center news release DNSC-04-2471, May 4, 1 p.

Defense National Stockpile Center, 2004b, Stockpile accepts crude iodine offer: Fort Belvoir, VA, Defense National Stockpile Center news release DNSC-04-2447, March 24, 1 p.

Defense National Stockpile Center, 2004c, Stockpile issues solicitation for iodine: Fort Belvoir, VA, Defense National Stockpile Center news release DNSC-05-2521, October 7, 1 p.

Durstenfeld, Bob, 2005, RAE systems launches low cost gamma radiation detector for law enforcement personnel: Sunnyvale, CA, RAE Systems press release, January 25, 2 p.

Freemantle, Michael, 2004, Nuclear power for the future: Chemical & Engineering News, v. 82, no. 27, September 13, p. 31-35.

Lundin, Lukas, and Posey, E.F., 2005, Atacama closes acquisition of ACF/s interest in the Aguas Blancas mine: Vancouver, British Columbia, Canada, Atacama Minerals Corp. news release, May 3, 1 p.

Schulz, W.G., 2004, Building a chemical laser weapon: Chemical & Engineering News, v. 82, no. 51, December 20, p. 43-44.

Sociedad Química y Minera de Chile S.A., 2004, SQM announces new investments in projects oriented to increase specialty fertilizers and iodine production capacity: Santiago, Chile, Sociedad Quimica y Minera de Chile S.A. press release June 30, 1 p.

Internet References Cited

Associated Press, 2004, Scientists revive ‘weather control’ dreams, accessed November 19, 2004 via URL http://www.theaustralian.news.com.au.

Barron, Joan, 2005, June 3, Cloud seeing moves ahead, Casper Star Tribune, accessed July 5, 2005, at URL http://www.casperstartribune.net/articles/2005/06/03/news/wyoming/88eb814c01c25c8b872570150001c6d4.txt.

Federation of American Scientist, 2005a (April 6), Airborne laser, accessed August 10, 2005, at URL http://www.fas.org/spp/starwars/program/abl.htm.

Federation of American Scientist, 2005b (April 6), Boost-phase intercept, accessed August 10, 2005, at URL http://www.fas.org/spp/starwars/program/bpi.htm.

Hunter, Philip, 2005 (January 14), Expanding the periodic table? The Scientist, accessed January 19, 2005, at URL http://www.the-scientist.com/news/20050114/02.

U.S. Department of Defense, 2004, Commodities for sale, accessed July 7, 2004, via URL http://www.dnsc.dla.mil.

GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

Iodine. Ch. in Mineral Commodity Summaries, annual.

Iodine. Ch. in United States Mineral Resources, Professional Paper 820, 1973.

Other

Iodine. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 875.

TABLE 1
SALIENT IODINE STATISTICS[1]

(Metric tons and dollars)

	2000	2001	2002	2003	2004
United States:					
Production	1,470	1,290	1,420	1,090	1,130
Imports[2]					
Quantity, for domestic consumption	4,790	5,030 r	6,190	5,750	5,700
Price, average[3]	14.59	13.94	12.70	11.81	13.38
Exports[2]	1,010	1,460	1,580	1,590	1,270
Consumption:					
Reported[4]	3,990	3,560	4,540	3,930	4,070
Apparent[5]	5,420	4,730	6,520	5,240	5,560
World, production	19,500	20,700	21,000	24,600 r	24,700 e

[e]Estimated. [r]Revised. NA Not available.

[1]Data are rounded to no more than three significant digits, except prices.

[2]Source: U.S. Census Bureau information reported by Harmonized Tariff Schedule of the United States code 2801.20.0000.

[3]Cost, insurance, and freight valuation.

[4]Reported by voluntary response to the U.S. Geological Survey from a survey of domestic establishments.

[5]Calculated by using domestic production plus imports minus exports plus adjustments for Government and domestic industry stock changes.

TABLE 2

DOMESTIC CONSUMPTION OF CRUDE IODINE, BY PRODUCT[1]

Product	2003 Number of plants	2003 Quantity (metric tons)	2004 Number of plants	2004 Quantity (metric tons)
Inorganic compounds:				
Resublimed iodine	8	165	7	527
Potassium iodide	5	394	5	525
Sodium iodide	5	427	4	49
Hydriodic acid	3	74	2	46
Potassium iodate	3	69	3	66
Miscellaneous iodate, and iodides[2]	3	82	2	51
Other inorganic compounds	5	662	4	535
Total	20 [3]	1,870	18 [3]	1,800
Organic compounds:				
Ethylenediamine dihydroiodide	3	141	2	185
Povidine-iodine (idophors)	3	401	3	395
Other organic compounds[4]	7	1,520	5	1,690
Total	20 [3]	2,060	18 [3]	2,270
Grand total reported consumption[5]	XX	3,930	XX	4,070
Apparent consumption[6]	XX	5,240	XX	5,560

NA Not available. XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes ammonium iodide, calcium iodate, and cuprous iodide.

[3]Nonadditive because some plants produce more than one product concurrently.

[4]Includes methyl and/or ethyl iodide.

[5]Reported by voluntary response to the U.S. Geological Survey in a survey of domestic establishments.

[6]Calculated by using domestic production plus imports minus exports plus adjustments for Government and domestic industry stock changes.

TABLE 3

YEAREND 2004 PRICES OF ELEMENTAL IODINE AND SELECTED COMPOUNDS

Elemental iodine/compounds	Value[1] Dollars per kilogram	Value[1] Dollars per pound
Iodine, crude, drums	13.25-14.50	6.11-6.69
Potassium iodide, U.S. Pharmacopeia, drums, 5,000-pound lots, delivered	25.76	12.27

[1]Conditions of final preparation, transportation, quantities, and qualities not stated are subject to negotiations and/or somewhat different price quotations.

Sources: Chemical Market Reporter, 2004, Current prices of chemicals and related materials, v. 267, no. 1, December 31, p. 21; U.S. Census Bureau.

TABLE 4

U.S. IMPORTS OF CRUDE IODINE AND POTASSIUM IODIDE FOR DOMESTIC CONSUMPTION, BY COUNTRY OF ORIGIN[1]

(Metric tons and thousand dollars)

	2003		2004	
Type and country of origin[2]	Quantity	Value[3]	Quantity	Value[3]
Iodine, crude:				
Canada	(4)	39	(4)	34
Chile	3,870	46,100	3,920	51,800
France	21	273	22	291
Germany	--	--	5	65
India	11	22	--	--
Japan	1,790	21,200	1,570	20,600
Jordan	16	205	--	--
Mexico	--	--	71	1,000
Netherlands	35	410	--	--
Russia	--	--	21	282
Spain	--	--	89	1,210
United Kingdom	--	--	(4)	3
Total	5,750	68,300	5,700	75,300
Potassium iodide:[5]				
Brazil	103	1,130	212	2,690
Canada	487	5,410	377	4,810
Chile	268	3,110	264	3,570
Japan	1	18	6	19
Other[6]	3 r	88 r	33	428
Total	863 r	9,760	892	11,500

r Revised. -- Zero.

[1] Data are rounded to no more than three significant digits; may not add to totals shown.

[2] Import information for crude iodine and potassium iodide are reported by Harmonized Tariff Schedule of the United States codes 2801.20.0000 and 2827.60.2000, respectively.

[3] Declared cost, insurance, and freight valuation.

[4] Less the ½ unit.

[5] Gross potassium iodide contains 76% crude iodine.

[6] Includes China (2004), Germany, and India (2004).

Source: U.S. Census Bureau.

TABLE 5

U.S. EXPORTS OF CRUDE IODINE AND POTASSIUM IODIDE, BY COUNTRY OF ORIGIN[1]

(Metric tons and thousand dollars)

Type and country of origin[2]	2003 Quantity	2003 Value[3]	2004 Quantity	2004 Value[3]
Iodine, crude/resublimed:				
Australia	1	11	--	--
Brazil	93	1,040	(4)	7
Canada	389	7,060	347	6,250
China	17	247	--	--
Dominican Republic	1	8	--	--
Germany	588	6,430	258	2,770
Jamaica	1	3	(4)	3
Japan	167	1,910	347	1,210
Korea, Republic of	1	11	(4)	14
Malaysia	5	19	6	24
Mexico	321	2,740	143	858
Saudi Arabia	1	10	--	--
Venezuela	4	65	12	182
United Kingdom	1	23	2	36
Other[5]	1 r	17 r	157	456
Total	1,590	19,600	1,270	11,800
Potassium iodide:[6]				
Australia	2	52 r	3	70
Colombia	5	102	(4)	11
France	14 r	299	29	591
Ireland	5	145	--	--
Mexico	1	24	5	125
Netherlands	(4)	5	2	56
Singapore	(4)	9	(4)	11
Taiwan	22 r	295	55	912
Turkey	2	32	--	--
United Kingdom	1	26 r	5	120
Other[7]	1 r	25 r	2	76
Total	51	1,010	101	1,970

[r]Revised. -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Export information for iodine, crude/resublimed and potassium iodide are reported by Harmonized Tariff Schedule of the United States coders 2801.20.0000 and 2827.60.2000, respectively.

[3]Declared free alongside ship valuation.

[4]Less than ½ unit.

[5]Includes Costa Rica (2004), El Salvador, France (2004), Hong Kong (2004), India (2004), Italy (2004), Jordan (2003), Mongolia (2003), Peru (2004), the Philippines (2003), Singapore (2004) Taiwan (2004).

[6]Gross potassium iodide contains 76% crude iodine.

[7]Includes Belgium (2004), Germany (2003), Israel (2004), Indonesia (2004), Republic of Korea (2004), New Zealand (2003), Malaysia (2004), Peru (2004), Sierra Leone (2004).

Source: U.S. Census Bureau.

TABLE 6

CRUDE IODINE: ESTIMATED WORLD PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country	2000	2001	2002	2003	2004
Azerbaijan	300	300	300	300	300
Chile[3]	10,474 [4]	11,355 [4]	11,648 [4]	15,580 [r, 4]	15,600
China	500	500	500	500	550
Indonesia	75	75	75	75	75
Japan	6,157 [4]	6,643 [4]	6,548 [4]	6,524 [r, 4]	6,500
Russia	300	300	300	300	300
Turkmenistan	200	200	200	200	250
United States	1,470 [4]	1,290 [4]	1,420 [4]	1,090 [4]	1,130 [4]
Uzbekistan	2	2	2	2	2
Total	19,500	20,700	21,000	24,600 [r]	24,700

[r]Revised.

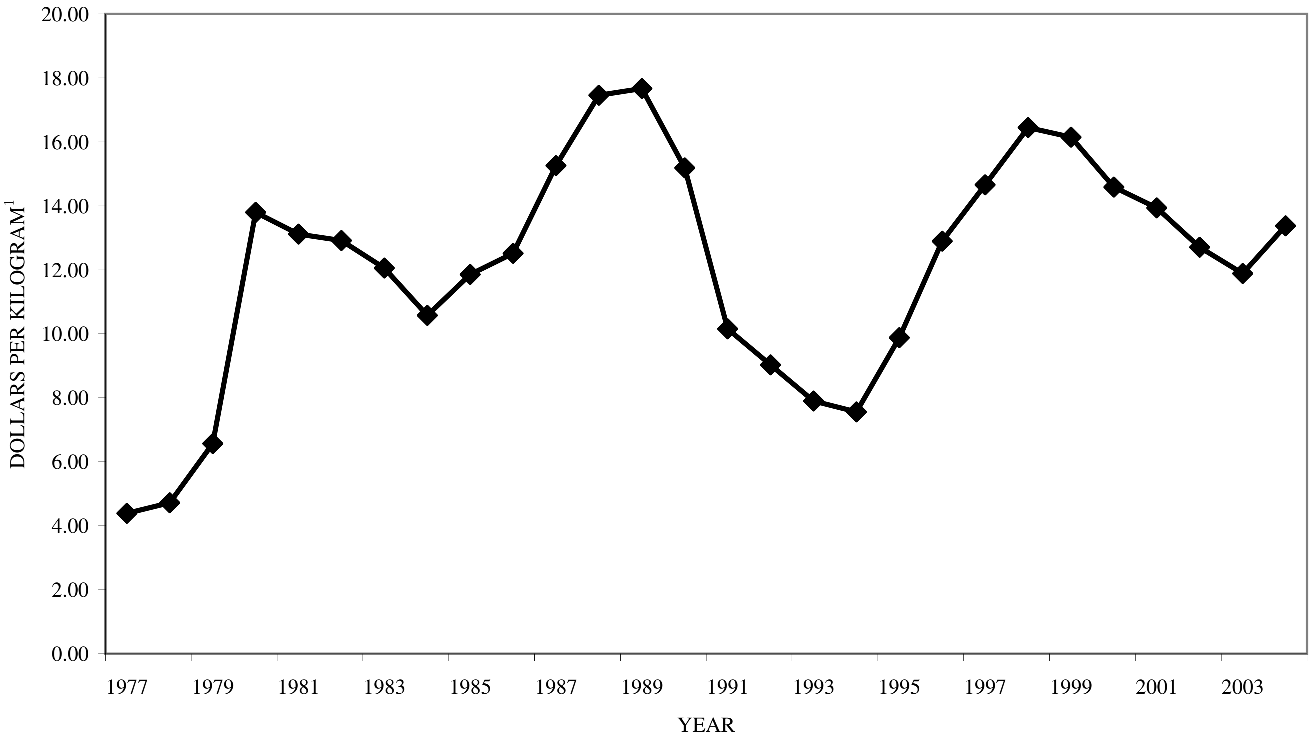
[1]World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Table includes data available through June 10, 2005.

[3]Includes iodine production reported by Servicio Nacional de Geologia y Minería.

[4]Reported figure.

FIGURE 1
HISTORIC IODINE PRICES



[1]Cost, insurance, and freight valuation.